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AUTHOR Becker, Joseph
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ABSTRACT

Major developments in the field of information science and technology are described for the decade 1968-1978, a period when some very important changes occurred. Information is defined as "the messages of human experience"; however, a distinction is drawn between information content and information processing. Reference is made to the recent convergence of computer and communication technology, the impact of on-line systems, the growth of the information profession, and the diversity which exists among information stakeholders today. The trend toward a U.S. information policy is cited and descriptions given of the key reports and publications which led to the creation of a new National Telecommunications and Information Administration in Washington. Also presented are a number of conflicts which exist in present federal policy statements, and a set of principles is proposed to guide the creation of a national information policy. (Author/JPF)

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THE INFORMATION DECADE

AN ADDRESS

BY JOSEPH BECKER*

TO THE INSTITUTE ON FEDERAL

DOCUMENTS AND INFORMATION ACCESSIBILITY

AMERICAN UNIVERSITY

APRIL 27, 1978

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY

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TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC) AND USERS OF THE ERIC SYSTEM."

*Member, U.S. National Commission on Libraries and Information Science

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The assignment I received from Lowell Hattery was to present a broad overview of the field of information in order to set the scene for the national policy discussions of this Institute.

My talk this morning, therefore, is divided into three parts. First, I will explain what information is and why it is important that the United States develop effective policies for its use. Second, I will describe the forces that led to the information environment we have today. And finally, I will speak to current information policy issues.

I find it somewhat hazardous to attempt an overall characterization of information because it is so pervasive. Information is of concern to everyone and it touches all aspects of our lives. Nonetheless, I think it essential that we try to define the concept so that we have a common framework for discussion.

Information can be defined as the messages of human experience. In this context, an information message can be seen from two perspectives--first from the point of view of its content, and second from the point of view of its processing and transfer.

The intellectual essence of an information message is its content. Process, on the other hand, refers to the means we use to produce, publish, communicate, organize, store, retrieve, and otherwise transfer information messages. It is useful to draw the distinction between content and process because, as we shall see, separate national policies may be required for each. Sometimes there is a tendency to confuse content with

process, so let us examine the two perspectives, one at a time, in order to develop an understanding of the characteristics, dimensions, and implications of information.

The content of an information message can cover any subject and appear in any language. It may deal with science or the humanities, be intended for an individual or for an institution, or relate to business or government. It may appear in printed or graphic form. It may be transported or be communicated electronically. And it may be evaluated information or unevaluated information.

We should be careful to distinguish information from knowledge. Knowledge derives from the process people use to understand and analyze information. A knowledgeable person is one who learns to fit substantive pieces of information into a pattern of thought that leads to intelligent action. Wisdom, on the other hand, is different still. A wise person is someone who applies knowledge successfully and has the ability to discern inner qualities and relationships.

When the content of information is viewed as the main ingredient of knowledge, its value as a national asset becomes apparent immediately. Recognition of the worth of information and of its potential power to solve national problems has prompted many countries to approach information as if it were almost a natural resource. A nation that makes this decision assumes an obligation to husband, organize, and safeguard the information it possesses as one would any important natural resource. National information resources relate in a vital

way to the quality of a nation's education and scientific programs, to its competitive economic posture in world markets, and to the maintenance of its national security.

It can be said, therefore, that information is the heart of enlightenment. It illuminates. And, because it does, it has the potential of being a force for human good. In a personal sense, it can help us sharpen our reason, increase our awareness, and revise our perceptions. In a national sense, it can help us educate our people, accelerate our progress, and provide the source data needed to solve complex economic, scientific, and social problems. In a world-wide sense, it can serve as the collective memory of record, helping us to hand down the dynamic history of our culture from one generation to the next.

It is surely a mistake to suppose, however, that everyone shares these perceptions. There are some people who view information as a source of power for economic gain or political advantage and they are inclined to impose electronic curtains between countries to screen or conceal information.

In America, we consider information to be a substantive resource intended for the benefit of all mankind. We firmly believe that information has the power, if used positively, to multiply human enjoyment and mitigate human suffering. We also believe that information knows no country and that the content of information messages about man's accomplishments and achievements should be shared by all people. Except for proprietary and military data, the policy of United States with regard to the content of the information we produce is to make it openly available.

I said earlier that information could be viewed from two perspectives--message content and message processing. The latter is concerned with how information messages are created, published, duplicated, disseminated, transported, indexed, cataloged, stored, retrieved, communicated, exchanged, and so forth.

Years ago the policy issues associated with information processing were manageable. The volume of information was moderate, information was restricted largely to print, the number of organizations engaged in the process was small, and computer, communications, and micrographic technologies had not yet made their debut.

What complicates the information environment today is not only the increase in the volume and diversity of information, but also the increase in the number and diversity of organizations and technologies that process information. Information messages abound in books, journals, and technical reports; in films, audio-visuals, and microforms; in digital, analog, and video tapes, and so forth. These materials are not just produced by government agencies, private publishing companies, and professional societies, they are also processed by a host of indexing and abstracting services, repackaged and sold by hundreds of companies, and serviced by tens of thousands of libraries and data centers in the United States.

In fact, the U.S. information environment has changed dramatically these past ten years and most of the action has taken place in the area of information message processing.

For the United States the years 1967 to 1977 will probably be known as the Information Decade. There may be information decades again, but it is unlikely that there will be another period quite like this one.

As we face the next ten-year period, therefore, it may be timely to review the character of the decade past and speculate a little about the future. While one cannot possibly recount all of the factors that accompanied the development of the Information Decade, I believe the more important ones can be identified.

They are found mainly in advances in technology, in the maturation of information as a science, and in the convergence of stakeholder interests. Knowing about all three is crucial to gaining an understanding of the information issues that will confront us during the next decade so let me comment on them briefly.

Without a doubt, the spectacular spread of computers has been the most significant influence of all. The non-numerical computer experiments of the fifties were put into practice in the sixties. We learned how to sort letters by computer; how to search, match, and count words; how to compare selected words with a thesaurus of standard words; how to tag, label and locate single words or strings of words; how to edit natural language by computer, and how to merge and purge records in a file. Software for the computer handling of words in the English language came of age during this period and computer hardware capabilities increased strikingly.

Computer speeds approached the speed of light and new devices permitted individuals to go "on-line" with a distant computer--sharing the computer's time simultaneously with many other users. The exciting notion that we called "time-sharing" back in '68 is now commonplace.

This marriage of computer and communications technology enabled data base suppliers to place their files on-line through time-sharing services. And, as a result, the number of on-line data bases produced by federal agencies and organizations in the private sector increased significantly.

Access to a computer data base via telecommunications made it possible for anyone with a terminal and a telephone to interrogate the data base of his or her choice. Centralized services in government and the private sector exist today for doing this. Lockheed, SDC, and BRS are prime examples.

The computer story is not complete, however, without mentioning the concomitant development of non-bibliographic information systems which operate in real-time. In the decade 1967-1977, earth orbiting satellites began to observe world crop production, look at weather patterns, detect energy resources, and so forth. For the first time, users were able to interact with a satellite, in real time, about specific objects on the ground.

Thus, the history of informarion in the post-1967 period saw developments occuring simultaneously in natural language research, in computer technology, and in the evolution of on-line and real-time information systems.

The second major technological advance to occur in the 1967-1977 decade was in the field of telecommunications. Telecommunications is defined as the exchange of information by electrical transmission over great distances. Three types of signals are involved: voice (that is, human speech), digital (the language of the computer, which we call data), and video (originating with TV cameras, facsimile scanners and the like). Each of these signals is associated with a telecommunications line that can carry it most efficiently. For voice, it is the telephone line. For data and TV signals it is the co-axial cable, the optical fibre, microwave, and the communications satellite.

During the 1967-1977 time frame, the U.S. began to upgrade its communication systems so that more data and TV signals could be accommodated. With the introduction of these new arteries of communication, geographic barriers were dissolved and the prospect of creating information networks became a reality. In fact, during the Information Decade, an experimental computer communications network called ARPANET, was pressed into operational service. ARPANET stretches 10,000 miles from Hawaii to Norway. It consists of 134 main computers of sixteen different manufacturers' models, connects 7) computing centers in 50 cities, and serves 2,200 terminals in 4 countries. ARPANET users, from these terminals, are able to confer with one another and share each other's data bases.

In an ideal sense the linking of computers with communications enables the information resources of one nation to be available to another. This concept of an information network represents a

major technological advance in information processing. Policy-makers throughout the world have only recently become sensitive to the political ramifications and economic implications of information networks.

Besides the advances made with computers and telecommunications, advances were also made in the area of micrographics technology. One important technique, developed during the last ten years, was COM (Computer Output Microfilm). It enabled a computer to write the results of its logical processing compactly on microfilm or microfiche instead of printing it out on reams of paper.

Advances were also made in holography and laser recording. Today, for example, a laser can write a line on film that is one or two microns wide--only .000039 inches.

It was during the Information Decade that microforms also became big business. Companies like the New York Times and the Congressional Information Service announced special microfilm information systems. And, in government, under the able stewardship of the late Bill Knox, we saw the successful introduction of a combined computer and microfilm information system for the handling of U.S. government technical reports.

Thus we see, that a major factor in the field of information during the past ten years has been the driving force of technological change. It has reached a new peak of sophistication. Man's appetite for new means of communicating information seems insatiable. And no matter how many new technologies we develop he is reluctant to let go of the old.

The second major factor influencing the Information Decade was the maturation of information science. Information science is not a pure science--it is an interdisciplinary science. Its character derives from the intersection of several fields--librarianship, documentation, computers, communications, graphic arts, records management, and others. As an interdisciplinary science, it draws on other sciences such as mathematics, logic, linguistics, psychology, operations research, engineering, and management science for its sustenance. To reflect this professional trend, the American Documentation Institute, which had been formed as a professional society of documentalists in 1937, changed its name in 1968 to the American Society for Information Science. In the same year, the Information Industry Association was established. Today, IIA's membership includes more than 100 commercial companies.

We see then that it was during the Information Decade that social change began to occur within the information field. The period was characterized by the reorganization of human resources into new prime mover groups and by the consolidation of interdisciplinary interests.

In addition to the impact of technology and the maturation of information science, a third factor to emerge during the Information Decade was recognition of the diversity of information stakeholders that make up the field. What became clearer during this period, was that their interests were intersecting and that they were growing more and more interdependent. Who are these stakeholders? In America, they consist of the authors and researchers who create information, the

publishers who disseminate it, the librarians who guarantee access to it, the documentalists who index it, the micro-photographers who compact it, and the archivists who preserve it.

But that is not all. There are also information brokers who repackage information for sale, computer specialists who digitize data bases, and communicators who transmit or broadcast information in every media. And, there are the network specialists who connect information files, centers, and systems to prospective users, and the information scientists who design information systems and perform research to extend the frontiers of knowledge in the field.

Only within the past few years has American begun to treat these diverse information processing organizations, technologies, and people as a cohesive community. The task is complex, however, because this community is made up of elements that come from both the public and private sector. Ours is a unique pluralistic society where private agencies are not ordered by the government to adopt guidelines, but rather encouraged to do so voluntarily. The policy of the United States has been to facilitate the harmonious growth of this community, therefore, without the imposition of strict government regulations.

Now that the technological and organizational ferment of the past decade is over what can we look forward to in the next ten years?

Certainly, one likely prospect is the evolution of a national information policy.

The term "information policy" has a variety of connotations. All of them, however, have one thing in common--they deal with the policies which govern the way information affects our society. To the Federal Communications Commission information policy may mean policy dealing with the regulation of computer messages over common carrier facilities; to the Justice Department it may mean policy with respect to the implementation of the Freedom of Information Act; to the National Science Foundation and the Department of State it may mean policy concerning the communication of scientific research results to foreign governments; to the U.S. Postal Service it may mean policy regarding competition with commercial computer and telecommunication networks; to the library community it may mean policy with respect to government support of national collections; to the businessman it may mean policy affecting the information reporting requirements imposed by federal and state governments; and to the information industry it may mean government policy concerning the distribution and sale of information produced by the federal agencies.

Although the term "information policy" has various meanings, the various perspectives are all part of a common family of interests. However, there is no focal point in government today where information policies can be viewed in a broad context and where information policy conflicts can be resolved. It is this serious deficiency which compels consideration of a national information policy.

Until now, Congress and the Executive Branch have been reactive, rather than proactive, with an ad hoc approach to developing information policies. For example, the strong

public outcry against threats to individual privacy from increased use of computerized data banks led to passage of the Privacy Act. Similarly, pressures for openness in government prompted passage of the Freedom of Information Act.

In order to frame responses to specific information issues, Congress also established a number of National Commissions. One is looking into the feasibility of networking libraries and information centers; another is investigating the information implications of electronics funds transfer systems; a third is studying copyright and the effects of electronic storage and retrieval of information on intellectual property; and there are others.

Two major documents relating to national information policy were published by my Commission (NCLIS) just within the last two years.

The first was a report of the Domestic Council prepared for President Ford. Entitled NATIONAL INFORMATION POLICY it is the most comprehensive summary yet published on national information issues. It examines information policy issues in a variety of public and private sector settings, analyzes the cross-cutting information interests of different segments of the government and stresses the need to balance the legitimate, though sometimes competing, interests of the individual citizen with society in general. It observes how our democratic ideals about the freedom of information can sometimes work to our economic disadvantage. And, it draws attention to the confusion which exists within the federal agencies concerning information dissemination, distribution, and selling practices.

The second report describes the way in which the traditional library infrastructure of the U.S. is being affected by the new technology. And, it enunciates a national policy which treats information as a national resource and guarantees equal right of access to the total information resource of the country by all citizens. At the same time, it points out how a policy supporting the national networking of information may be in conflict with traditional policies of local self-sufficiency and autonomy.

Congressional concern about information policy is serious. Last January, for example, the Committee on House Administration of the U.S. House of Representatives issued a newsletter--called, incidentally, INFORMATION ON INFORMATION--which listed scores of bills and resolutions submitted during the first session of the 95th Congress dealing with information technology. The list itself was compiled by the Library of Congress's computerized information retrieval system called SCORPIO and from its sister system in the House of Representatives called LEGIS.

On the Executive Branch side we find several government agencies responsible for different aspects of U.S. information policy. They include the Office of Management and Budget, the National Commission on Libraries and Information Science, the Department of Commerce, the Domestic Council, the Federal Communications Commission, the Office of Science and Technology Policy, and the Department of State. Finally, and most important, the President recently designated a new Assistant Secretary for Communications and Information. His name is Henry Geller, formerly General Counsel for the Federal Communications Commission;

his confirmation hearings were held a few weeks ago. Under reorganization Plan No. 1 Geller will head up a new National Telecommunications and Information Administration whose purpose will be, among other functions, to develop a mechanism in government that can deal with information policy issues as they arise.

It's highly doubtful that a single policy will be able to embrace all possible national information issues. Instead I expect we will develop a single set of principles which will be a framework to guide the evolution of national policies in many different problem areas.

To summarize this morning's talk, I wish to present a strawman of such a set of principles for your consideration. I feel they are basic to any U.S. Information Policy. With respect to the content of information:

> First, United States policy is based on a belief in the freedom of speech and thought.
>
> We believe in the open availability of information; and,
>
> We reject the notion of censorship or the use of barriers to restrict the natural flow of information between and among people;
>
> Second, United States policy is based on a recognition of information as a national resource to be developed, organized, and made available in the public interest;
>
> We are dedicated to the widest possible utilization of this resource and the right of all the people to have equal opportunity of access to it according to their individual needs;
>
> And, third, United States policy is directed at furthering reciprocal access to information by all countries;

We believe that the tenets which govern U.S. national information policy should also be the starting point for building relationships with other countries;

We recognize the feeling of urgency of the less developed countries for access to information; and,

We recognize our own responsibility to help them reach and utilize the total information resources of the U.S.

With respect to information processing:

United States policy is to place in the public domain all unclassified information produced by its federal agencies and to disseminate it through all effective communication channels available in the public and private sectors;

We acknowledge the responsibility of private enterprise to repackage information and broker its distribution and use;

We respect the right of personal privacy in information systems;

We encourage the development of library and information networks nationally and internationally;

We seek the closest possible coupling of computer and communication capabilities;

We urge the adoption of technical standards that will lead to compatibility among information systems; and,

We pledge our cooperation in assisting developing countries to build internal communication infrastructures that will make them active partners in the global information exchange process.

Although the Information Declaration which I have just read represents a personal view, it does contain the gist of what a prospective official U.S. Information Policy might be. There are, however, many viewpoints and many approaches to the problem which have yet to be debated and reconciled. I expect this will happen in 1978 because information, as an issue, is receiving more top level attention in U.S. national planning than ever before.

"Information is the key to the wise management of our future. Perhaps the most important event of the next decade will be the recognition of the true value of information--the right information, reliable and relevant to our needs, available in a useful form to all those who need it." (1)

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(1) Information in a Changing Society. Organization for Economic Cooperation and Development. Paris. 1971, p. 5.